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U. S. DEPARTMENT OF AGRICULTURE,

BUREAU OF PLANT INDUSTRY,

New and Rare Seed Distribution,

WASHINGTON, D. C.

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DISTRIBUTION OF COTTON SEED IN 1920.

This is the eighteenth distribution of cotton seed conducted by the Office of Seed Distribution in cooperation with the cotton-breeding investigators of the Bureau of Plant Industry.

During the past 15 years, approximately 50 varieties of cotton have been distributed. These have been developed by the experts of the Bureau of Plant Industry or selected by them because of special local value.

The method of distribution followed in the past few years has proved so generally satisfactory that it is proposed to continue it this season. The general distribution of a small quantity of seed (1 quart), to enable the farmer to become acquainted with the characteristics of the variety, will be followed in the most promising sections by a special distribution the following year, which is fully explained under the heading "Report of results of planting." This special distribution furnishes to those who submit favorable reports and sample bolls of the crop grown from the quart package of seed sufficient seed to produce at least one full bale of the new variety of cotton and also to produce a stock of seed for planting a considerable acreage the following season.

The seed of only one new variety is being distributed this year. It is now considered more important to establish a few superior varieties in general cultivation than to add to the number of new varieties. Experience with former distributions shows that supplies of pure seed must be maintained by the Department of Agriculture and repeated distributions made until a new variety has become well established.

An introductory statement on "Improvement of the cotton crop by selection," by O. F. Cook, who is in charge of the cotton-breeding work of this bureau, explains how the seed may be utilized to the best advantage by the farmer.

R. A. Oakley,
Agronomist in Charge.

Approved:
Wm. A. Taylor,
Chief of Bureau.

October 30, 1919.

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IMPROVEMENT OF THE COTTON CROP BY SELECTION.

How can the farmer make the best use of a small stock of seed of a superior selected variety? By understanding and applying the methods by which select seed is produced, so as to keep the selected variety from deterioration. The usual way of treating a small quantity of select seed is not at all calculated to enable the farmer to learn the true value of a new variety or to preserve the purity of an improved stock.

TESTING NOT TO BE COMBINED WITH SELECTION.

A mistake made frequently by farmers, and sometimes by professional breeders, is to attempt to combine testing with breeding. The new variety of cotton is planted by the side of the local variety or a mixed stock in order to test its behavior, and seed is saved from the same planting to increase the stock of the new variety. This plan is open to the serious danger that the seed of the new variety when gathered in the fall will not be pure, on account of being contaminated by crossing with the local variety, so that its special value will be lost. The amount of crossing differs with the locality and the season, depending on the abundance of bees or other insects that carry the pollen from one flower to another, but there is usually too much crossing to make it safe to rely on the purity of any stock of seed that has been grown close to another variety of cotton.

ISOLATION OF SEED PLANTS.

A farmer who wishes to make a really adequate test of the value of a new variety should plant the seed in a separate plat, removed at least 300 yards from other fields of cotton or separated therefrom by 25 or 30 rows of corn. An isolated planting does not provide, of course, for a close comparison with the local variety, but this can be made in the following year to much better advantage. With the larger stock of seed then available a field planting can be made, as well as test plantings. In the third year there will be enough seed to stock even a large farm with the new variety, if it has shown itself superior under the local conditions.

Many farmers are unwilling to give the proper care to a new variety until they have made a preliminary test and convinced themselves that it is really superior. It is for this reason that the plan of sending out a smaller quantity of seed in the general distribution has been adopted. Those who use this small sample of seed for testing purposes and plant it in the same field with another variety or a mixed stock of cotton are advised not to save seed in the fall with any idea that they are keeping a pure stock of the new variety in this way. If the farmer is convinced that the new variety is supe-

rior, he should get a fresh stock of the seed and plant it in a separate breeding plat, as far away as possible from any other field of cotton.

The distribution of seed of superior varieties of cotton is no longer limited to a single season, as the custom formerly was. Unless improved varieties become established in cultivation in some part of the United States the work of breeding and distribution serves no useful purpose. To increase the number of varieties in a community is not desirable. On the contrary, there would be a distinct advantage if the whole community would grow one variety, if the best variety could be determined. The danger of mixture of varieties by crossing and the mixture of seed at the gin would both be reduced, and the uniformity of the product would enable the community to secure a higher price for its cotton.[1]

WHY SELECTION MUST BE CONTINUED.

Unless selection is continued, the value of a variety is sure to decline. A well-bred variety is superior to ordinary unselected cotton not only in having better plants but in having the plants more nearly alike. Whether selection has any power to make better plants is a question, but there can be no doubt of the power of selection to keep the plants alike. Even in the best and most carefully selected stocks inferior plants will appear, and if these are allowed to multiply and cross with the others the stock is sure to deteriorate. The pollen from the flowers of inferior plants is carried about by bees and other insects, and the seed developed from such pollen transmit the characters of the inferior parent. Even if they do not come into expression in the first generation they are likely to reappear in the second generation.

To grow cotton from unselected seed involves the same kind of losses as in an orchard planted with unselected seedling apple trees. Less cotton is produced and the quality is also inferior. The higher the quality of the cotton the more stringent is the requirement of a uniform staple. Unless the fibers have the same length and strength they can not be spun into fine threads or woven into strong fabrics.

PRESERVATION OF VARIETIES BY SELECTION.

The method of selection to be followed in preserving a variety from deterioration is entirely different from that employed in the development of new varieties. The breeder of new varieties seeks for exceptional individuals and prefers those that are unlike any variety previously known. If the selection is being carried on to preserve a variety, the object is not to secure seed from the peculiar plants, but to reject all that deviate from the characters of the

[1] Some of the numerous advantages to be gained by a better organization of cotton-growing communities have been described in an article published in the Yearbook of the Department of Agriculture for 1911 under the title "Cotton Improvement on a Community Basis."

variety. The first qualification for such selection is a familiarity with the habits of growth and other characters of the variety, to enable the farmer or breeder to confine his selection to the plants that adhere to the "form" or "type" of the variety and to reject all that vary from the type. Most of the latter would prove to be very inferior and at the same time would increase the diversity of the variety and hasten its degeneration.

IMPROVED METHODS OF FIELD SELECTION.

No matter how good a new variety may be or how carefully it may have been bred and selected, inferior plants are likely to appear, especially when it is grown under new and unaccustomed conditions. A special effort is being made to limit the distribution to seed from uniform fields of cotton, but selection is necessary to keep any variety from deterioration, and it is inadvisable to wait until the deterioration becomes serious before beginning the selection. If proper attention be paid to the rogning out of inferior plants in the first season there may be much less variation in the second, the variety becoming better adjusted to the new conditions.

As uniformity is one of the first essentials of value in a variety, the behavior of a new variety in this respect is one of the first things to be noted. Do not wait till the crop matures, but watch the plants in the early part of the season. Even before the time of flowering it is possible to distinguish "freak" plants by differences in their habits of growth or the characters of their stems and leaves. Whenever such variations can be detected they should be pulled out at once, in order to prevent the crossing of the good plants with inferior pollen. After the bolls begin to reach mature size it is well to go through the plat again and pull out all plants that show by the small size or other peculiarities of the bolls that there had been a variation from the standards of the variety. These preliminary selections greatly simplify the final selection in the fall, when attention can be limited to the yield and to the characters of the lint and seeds.[1]

USE OF PROGENY ROWS IN SELECTION.

Selection can be made still more efficient by the use of progeny rows. The seed of select individual plants is picked separately into paper bags and planted the next season in adjacent rows, in order to test the behavior of the progenies of the different individuals. An inferior progeny can be rejected as a whole and selection limited to the best rows. It often happens that a very good plant produces a

[1] Methods of selection are treated in greater detail in Circular No. 66 of the Bureau of Plant Industry, U. S. Department of Agriculture, entitled "Cotton Selection on the Farm by the Characters of the Stalks, Leaves, and Bolls." See also Bulletin No. 159 of the Bureau of Plant Industry, U. S. Department of Agriculture, entitled "Local Adjustment of Cotton Varieties."

comparatively inferior progeny, which would not be excluded from the stock unless the progeny-row test were made.

Nevertheless the use of progeny rows is no substitute for skill and care in making the selection, for if the selected plants are not all of the true type of the variety, admixture by cross-pollination will occur in the progeny rows the same as in a mixed planting. Protection against the danger of crossing between different progenies can be secured by holding over a part of the seed of the select individuals used to plant the progeny rows. The remainder of the seed that produced the best progeny row can be planted in an isolated breeding plat in the year following the progeny test. In this way a special strain is developed from a single superior plant.

METHODS OF TESTING COTTON VARIETIES.

The best way to test the behavior of two varieties of cotton is to plant them in alternate rows so that they can be compared carefully during the growing season and the yield of each row weighed separately at the end of the season. Of course, it is often possible to judge that one variety is superior to another without weighing, but if the results are nearly equal, weighing is necessary. Even experienced cotton men are likely to make errors in guessing at the yields of different rows of the field. A variety that "scatters" its lint may appear to be yielding much more than a stormproof variety with dense compact lint that can be shown to be much more productive by comparison of actual weights of seed cotton and percentages of lint.[1] The lint values are also to be compared, especially in long-staple varieties.

ADMIXTURE OF SEED IN GINS.[2]

One of the most serious difficulties in maintaining the uniformity of a superior variety of cotton is the mixture of seed in gins. A few farmers have their own gins or small hand gins for their seed cotton, and in some localities ginning establishments are beginning to provide small gins that are kept clean for ginning seed cotton. Some farmers take care to avoid the mixture of seed by holding their seed cotton until the end of the season, when the time can be taken to clean out the gin. It is also possible to plant progeny rows or seed plats with unginned seed by wetting the lint before planting or by pressing the seed into moist ground.

O. F. Cook,
Bionomist in Charge.

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[1] See Circular No. 11 of the Bureau of Plant Industry, entitled "Danger in Judging Cotton Varieties by Lint Percentages," which may be had from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 5 cents a copy. See also Bulletin No. 644, U. S. Department of Agriculture, entitled "Lint Percentage and Lint Index of Cotton and Methods of Determination."

[2] For a complete discussion of the admixture of seed in gins, see Bulletin 288 of the U. S. Department of Agriculture, entitled "Custom Ginning as a Factor in Cotton-Seed Deterioration," which may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 5 cents a copy.

REPORT OF RESULTS OF PLANTING.

Inclosed with the quart package of cotton seed sent for the preliminary trial will be found a yellow return card showing the variety of the seed sent, which is to be returned to the Department of Agriculture in case the grower is willing to cooperate in testing the comparative value of this variety. To those returning this yellow card, a blank form will be sent in the fall of 1920 for use in giving a detailed report of the results obtained, including the following items:

(1) Character of the soil.

(2) Character of the season.

(3) Whether the seed of the new variety was isolated or planted with a local variety for comparison.

(4) Name of local variety used for comparison.

(5) Size and yield of row or plat of the new variety.

(6) Yield of equal row or plat of the local variety.

(7) Rating of the new variety for your section—whether excellent, good, fair, or poor.

(8) A sample of seed cotton representing ten 5-locked bolls, the seed cotton from each boll to be picked carefully and wrapped separately in a small piece of paper.

Should the report of the preliminary test prove to the Department of Agriculture that the variety is desirable for the grower's conditions and if a 10-boll sample of the seed cotton is submitted in accordance with instructions, he will be permitted to share in the special distribution of half-bushel lots of seed of the same variety the following season.

In order to take advantage of this special distribution it will be necessary for the grower to keep careful notes of the behavior of the plants grown from the quart package of seed, so that a complete report can be made on the blank which will be sent for that purpose.

The sample bolls are to be used for determining the length, quality, and percentage of lint. This information, together with the detailed report, will enable the cotton experts of the department to decide whether the variety is promising under the grower's conditions and will aid in assigning the distribution of the larger lots of seed to such communities only as are likely to adopt the new varieties and establish them in regular cultivation.

The samples should be accompanied by the name and address of the grower, as well as the name of the variety grown. In previous years it has been necessary to discard many samples because they were not marked and there was no way to identify them.

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